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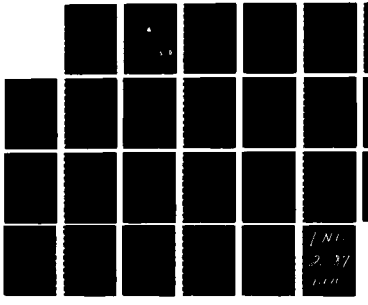

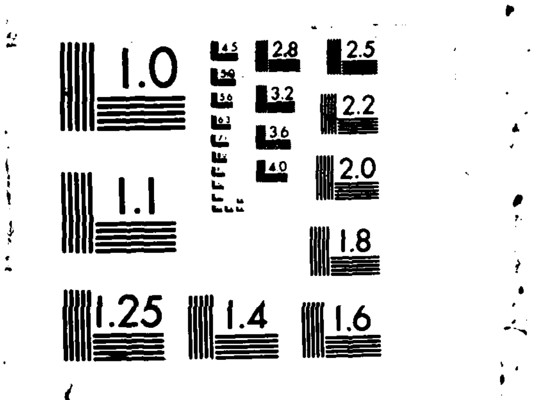

ROCOPY RESOLUTION TEST CHART

Technical Memorandum WHOI-4-86

Woods Hole Oceanographic Institution

Technical Memorandum No. 4-86

A User's Manual for Finite Difference Synthetic Seismogram Codes on the CYBER 205 and CRAY XMP-12

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by

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TECHNICAL MEMORANDUM

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A USER'S MANUAL FOR FINITE DIFFERENCE SYNTHETIC SEISMOGRAM CODES ON THE CYBER 205 and CRAY XMP-12

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CONTENTS

Abstract

Over the past eight years, a software package has been developed to solve the elastic wave equation by the method of finite differences (Hunt et al., 1983; Stephen, 1983; Stephen, 1984a; Stephen, 1984b; Nicoletis, 1981). The elastic wave equation can be solved in two dimensions for point sources in cylindrical coordinates or line sources in rectangular coordinates. Compressional and shear velocity and density are allowed to vary both vertically and radially.

Since the code is very computationally intensive for realistic size models, it has been implemented on two Class VI super computers: the Cyber 205 at Purdue University and the Cray XMP-12 at the Naval Research Laboratory. This technical report is a user's manual for running the code on these machines. It is assumed that the reader is already familiar with running the code on the VAX 11-780 (Hunt et al., 1983).

A. FINDIF on the CYBER 205

(Based on Notes by Mary M. Hunt - May, 1985)

Introduction

The CYBER system at Purdue includes two different computers and two different operating systems. All jobs must be submitted through a Front-End machine, which is a Cyber 6600 with the MACE Operating System (developed at Purdue). Interactive use, except for simple jobs like editing, is not encouraged even on the Front End. The main differences, for our purposes, between the Purdue system and the usage on the VAX are:

1. Method of including alternate code during compilation (INCLUDE).

2. No interactive operation on Cyber.

3. Greater difficulty of use of the Cyber operating systems.

The Finite Difference software, as implemented at Purdue, includes four programs. Operation is similar to that on the VAX, but different enough to make it necessary to document the Cyber usage. This document has two parts. The first explains the Cyber features which will be used the most, and the second gives step by step instructions for running the FINDIF software.

To Log on to the Purdue System

1. Set your terminal to 1200 Baud.

2. Neither Telenet nor Purdue allows type ahead.

3. You can call Telenet through the PACX or through a modem.
   Dial Telenet 540-7500 (or 7501, 7502, 7503, 7504)
   (or dial direct 1-800-424-9494)

4. When you are on-line, strike the RETURN key twice. Telenet responds

   TERMINAL =

   Enter D1 for VT100 type terminal, or A8 for the IPC Decwriter.

5. Telenet prompts with @

   Enter ID ;31264/PURDUE118

   Telenet asks for PASSWORD

   You should now be connected with PURDUE.

6. Purdue asks Port type?

   Enter P, no carriage return until the system completes the word PROCSY.

7. System asks for ACCOUNT? which is 60118
   USER ID? which is BJH
   PASSWORD?

8. Purdue asks for SYSTEM? Respond with RETURN.

   However, if you are using the Decwriter, and want to use all 132 columns,

   respond to SYSTEM? WITH TTYSET,WIDTH=132

9. You are almost ready to do your thing, but before proceeding, you should

   send a few commands to Telenet to allow control characters to get to

   Purdue. First, strike CR @ CR . You should get the Telenet prompt (@).

   Enter the following commands:

```
ENAB TFLO
SET 3:254
PAGE 132 66        if you want 132 column output
CONT               to get back to Purdue.
```

10. You are now all set. A sample of this procedure is given in Figure 1.

11. To log off the system: LOG. Then you can turn off your terminal.

Figure 1

Sample Log On

```
TELENET
617 17C

TERMINAL=A8

@ID ;31264/PURDUE118
PASSWORD =


312 64 CONNECTED

Port type? PROCSY
TCB R472 16.00.08. 04/24/85.  HALF DUPLEX
ACCOUNT? 60118
USER ID? BJH
PASSWORD?
THIS USERID LAST LOGGED OFF AT 15.44.10. 04/24/85.
SYSTEM? TTYSET,WIDTH=132
SYSTEM?
PIRATE
@++
TELENET

@ENAB TFLO

@SET 3:254

@PAGE 132 66

@CONT

+++GET DOPREP
```

File Handling on the Front-End

In order to access a file, a copy of the file must be moved into the user's local work area. This is done with the GET command. For example, if you want to edit a file named JOBFL, you must first issue the command

GET, JOBFL

to get a copy of the file. Then, after you have edited it, if you want to store the new copy back into permanent file storage, use the command

PUT, JOBFL

If you forget the PUT, your edited version of the file will disappear at the end of your job.

Control Characters on the Front-End

Use CTR B to stop a job, equivalent to CTR Y on the VAX

Use CTR H to delete previous character in line

Job Submission and Retrieval

To submit a job, use the command

XMIT,xxxx,nnnnnn where

xxxx is a job identification, can be any 4 characters
nnnnnn is the name of the job file, must be a local file

This same procedure is used for both Front-End jobs and 205 jobs. You should not have two jobs with the same identification in the system at the same time. If you want to wait for the job to run, enter the command

PREVIEW xxxx

When a job runs, it creates a DAYFILE, the same as a .LOG file on the VAX. This file will not remain in the system for much more than 1/2 hour, so to save it to look at later, you must ROUTE it to WAIT, but you must give it a numeric identification:

ROUTE xxxx TO WAIT AS mmmm where mmmm is numeric

You can check to see if a job has run with the command

SEARCH

If the letters PR follow the job id., then the job has run. To look at it, you must

ROUTE mmmm FROM WAIT TO PROCSY

Job Submission and Retrieval (Continued)

Then you can PREVIEW mmmm

If you want it printed out at PURDUE,

ROUTE mmmm TO MATH AS 2000.

They will mail it to you.

Implementing the INCLUDE

The procedure required to include COMMON files into a source deck, using UPDATEP, is a rather cumbersome two-step process. I have worked it out so it is more or less automatic.

First, your basic source file is subdivided into COMDECK's and DECK's, as in Figure 2. COMMON blocks which do not change are completely specified, but variable blocks remain undefined. The first step is to incorporate the COMDECK's into the DECK's, to create what they call the Program Library. There is a job-file to do this step for each program, as shown in Table I. These create the files BNYLIB, SORLIB, and FINLIB. Probably the programs should be stored this way. However, if they will need any editing, you might as well use the QED editor, and start from the DECK files.

Then, after you have run FDPREP to create the COMMON files, you can incorporate the COMMON file into the library file to create a COMPILE file. All the files for this procedure are given in Table I. In the case of both FDBNY and FINDIF, this second step also incorporates the code for the variable program loop. The job files for this step read the update code from the files created by FDPREP, and read the variable loop code from the specified files. This second job creates the files which are sent to the 205 for compilation.

Figure 2

Form of Source File

```
*COMDECK MODPAR
      COMMON /MODPAR/  IRECT, IDENS, IFLAT, IKELLY
      COMMON /MODPAR/  IEXPL, IVERT, ITRAN, ISORB, ISNST
        etc.
*COMDECK IOUNIT
      COMMON /IOUNIT/  LULOG, LUINP, LUBNY, LUSRC
      COMMON /IOUNIT/  LUSNP, LUTST
*COMDECK COMFDB
      COMMON /COMFDB/
*DECK FINDIF
      PROGRAM FINDIF
            .
            .
            .
*CALL MODPAR
*CALL IOUNIT
*CALL COMFDB
            .
            .
      END
*DECK ABSORB
      SUBROUTINE ABSORB
            .
            .
            .
*CALL MODPAR
*CALL COMFDB
            .
            .
            .
      END
*DECK TSTEP1
      SUBROUTINE TSTEP1
            .
            .
            .
*CALL MODPAR
*CALL COMFDB
            .
            .
            .
      END
```

Table I

Files used during UPDATEP procedures

Program	Basic Source File	Job-file to create Library file	Name of Library file	Job-file to Create Compile file	File Containing Update code	Compile File
FDBNY	FDBNY	MAKLIB	BNYLIB	UPDBLIB	BNYUPD	BNYFOR
FDSORS	FDSORS	MAKSLIB	SORLIB	UPDSLIB	SORUPD	SORFOR
FINDIF	FINDIF	MAKFLIB	FINLIB	UPDFLIB	FINUPD	FINFOR

TAPES

1. Tape Storage

Tapes are stored by slot number, which is assigned by the Tape Librarian at Purdue. When you send them a tape, or buy one from them, they will let you know the slot number. To find out what tapes you have there, enter the command

SLOT

Figure 3 is a sample of the output from SLOT.

```
+++SLOT
FOR UID=BJH:
 SLOT VSN     FILE ID          CDATE STATUS  F   CV DENS VPK R-KEY W-KEY VA F
 0765         UNKNOWN                  ..F       0
 2035         UNKNOWN                  ..F       0
 2036 AI1055                   85057 ..        LIT AS 6250 MHE
 0777                          85072 ..        NOS 0  1600 RAS
```

Figure 3

2. Visual Protect Key (VPK)

Every tape has a Visual Protect Key, which you must specify for each tape. This key consists of three letters (digits not allowed). The key is written on an external sticker on the tape, and you must specify it every time you want to write on the tape.

3. Labeled Tapes

The CYBER 205 can write ANS labeled tapes, which can be read on the VAX. However, when giving the VAX the file name, you must enclose the file name in double quotes "CRS01T". They do not use file types.

4. Tape Backup on the Front-End

This is one of the nicer features of their system. We have one tape reserved for Backup (in slot 777, VPK is RAS). Also, there is a permanent file in our directory which contains information about our backup tape, and what it contains. To back-up current files, enter the command

DUMP.

System will ask for Master password.

To retrieve selected files, enter the command

LOAD,file1,file2,...

You will receive a message when they have been loaded.

5. Copying Files to Tape on the Front-End

This appears to be fairly easy, at least for source files. Use

XTWRITE

which is documented in one of their manuals (IO MAGTAPE).

6. Creating Files on the 205

This is very messy, but the instructions included in the job-file for FINDIF appear to work. Use 6250 BPI because the files are large.

7. Tape Backup on the Back-End

To "dump" on backend submit a file like:

RESOURCE, NT = 1, JCAT = 53, TL = 1200.

ATTACH, file 1 .

ATTACH, file 2 .

DUMPF, file 1, file 2, DEV = NT, D = 6250, SLOT = sn/vpk/vsn.

To retrieve to backend:

RESOURCE, NT = 1, JCAT = 53, TL = 1200.

LOADPF, file 1, file 2, SEL = R, DEV = NT, D = 6250 SLOT = sn/vph/vsn .

DEFINE, file 1.

DEFINE, file 2.

Figure 4

Sample of DISPLAY, with record numbers

```
+++GET GETIM
 GETIM         72 WORDS
+++DISPLAY GETIM
    1.000=       PROGRAM GETIM ( TAPE12, TAPE15 )
    2.000=C
    3.000=       HALF PRECISION  XOPT(15), XOPT2(2), DATA(2000)
    4.000=       INTEGER         IOPT1(29), IOPT2(3), IOPT3(4)
    5.000=C
    6.000=       OPEN ( UNIT=12, FILE='DOR01T', STATUS='OLD' )
    7.000=       READ(12,1000)  IOPT1
    8.000= 1000 FORMAT( 8I2, 21I5 )
    9.000=       READ(12,1010)  IOPT2, XOPT
   10.000= 1010 FORMAT( I2,2I8,9F7.4,F6.5,2F5.4,F11.4,F8.4,F12.5 )
   11.000=C
   12.000=       READ(12,1020)  IOPT3, XOPT2
   13.000= 1020 FORMAT( 4I10, 3F12.5 )
   14.000=       KCNT = IOPT3(3)
   15.000=       READ(12,1030)  ( DATA(I),I=1,KCNT )
   16.000= 1030 FORMAT( 12E11.4 )
   17.000=C
   18.000=       OPEN ( UNIT=15, FILE='TMSER', STATUS='NEW' )
   19.000=       WRITE(15,1000)  IOPT1
   20.000=       WRITE(15,1010)  IOPT2, XOPT
   21.000=       WRITE(15,1020)  IOPT3, XOPT2
   22.000=       WRITE(15,1030)  ( DATA(I),I=1,KCNT )
   23.000=C
   24.000=       CLOSE ( UNIT=15 )
   25.000=       STOP
   26.000=       END
   27.000=$EOR
```

Figure 5

Sample of QED

```
+++QED GETIM
#4P3
     4.000=       INTEGER          IOPT1(29), IOPT2(3), IOPT3(4)
     5.000=C
     6.000=       OPEN ( UNIT=12, FILE='DOR01T', STATUS='OLD' )
#4P#9
     4.000=       INTEGER          IOPT1(29), IOPT2(3), IOPT3(4)
     5.000=C
     6.000=       OPEN ( UNIT=12, FILE='DOR01T', STATUS='OLD' )
     7.000=       READ(12,1000)  IOPT1
     8.000= 1000 FORMAT( 8I2, 21I5 )
     9.000=       READ(12,1010)  IOPT2, XOPT
#10.1I
    10.010=C  THIS IS AN EXAMPLE OF HOW TO USE QED
    10.020=C   IT IS PRETTY SIMPLE-MINDED.
    10.030=#9P5
     9.000=       READ(12,1010)  IOPT2, XOPT
    10.000= 1010 FORMAT( I2,2I8,9F7.4,F6.5,2F5.4,F11.4,F8.4,F12.5 )
    10.010=C  THIS IS AN EXAMPLE OF HOW TO USE QED
    10.020=C   IT IS PRETTY SIMPLE-MINDED.
    11.000=C
#10D3
#9P4
     9.000=       READ(12,1010)  IOPT2, XOPT
    11.000=C
    12.000=       READ(12,1020)  IOPT3, XOPT2
    13.000= 1020 FORMAT( 4I10, 3F12.5 )
#S
```

Figure 6

Sample of DISPLAY, without record numbers

```
+++ DISPLAY GETIM,1,999,SUP
      PROGRAM GETIM ( TAPE12, TAPE15 )
C
      HALF PRECISION  XOPT(15), XOPT2(2), DATA(2000)
      INTEGER         IOPT1(29), IOPT2(3), IOPT3(4)
C
      OPEN ( UNIT=12, FILE='DOR01T', STATUS='OLD' )
      READ(12,1000)  IOPT1
 1000 FORMAT( 8I2, 21I5 )
      READ(12,1010)  IOPT2, XOPT
C
      READ(12,1020)  IOPT3, XOPT2
 1020 FORMAT( 4I10, 3F12.5 )
      KCNT = IOPT3(3)
      READ(12,1030)  ( DATA(I),I=1,KCNT )
 1030 FORMAT( 12E11.4 )
C
      OPEN ( UNIT=15, FILE='TMSER', STATUS='NEW' )
      WRITE(15,1000)  IOPT1
      WRITE(15,1010)  IOPT2, XOPT
      WRITE(15,1020)  IOPT3, XOPT2
      WRITE(15,1030)  ( DATA(I),I=1,KCNT )
C
      CLOSE ( UNIT=15 )
      STOP
      END
$EOR
```

Steps for running FINDIF on Cyber 205

1. Create a model parameter file, which can be free field format, except for the first two records. The contents of the records:

   Record 1: LABEL, up to 80 characters

   Record 2: Model identifier, 5 characters, much be in first 5 characters

   Record 3: values of IRECT, IDENS, IFLAT, IKELLY, IEXPL, IVERT, ITRAN, ISORB, ISNST

   Record 4: values of MM, NN, KK, KSTRT, DELT, DELR, DELZ

   Record 5: values of KOUTST, KOUTEN, MOUTST, MOUTEN, NOUTST, NOUTEN

   Record 6: values of KINC, MINC, NINC, KMARK, KMINC

   Record 7: values of VP1, VS1, RO1, VP2, VS2, RO2, NA, NB, VPT, VST, ROT

   Record 8: values of ND, MSW, NSW

   Record 9: values of NSORCE, PLSWID, TSWAVE

   Figure 7 is a sample model parameter file. Record numbers are not part of the file.

NOTE: In the current version the number of timesteps (KK) must not exceed 8192 and the total number of snapshots INT(((KK-KMARK)/KMINC)+1·) must not exceed 26.

```
+++DISPLAY CRS01

  1.000=  CRS01:  ROSE SCATTERING - GRADIENT
  2.000=CRS01
  3.000=1, 1, 1, 1, 1, 0, 0, 1, 2
  4.000=999, 300, 4000, 1000, 0.00125, 0.01, 0.01
  5.000=1500, 4000, 1, 999, 48, 148
  6.000=2, 50, 50, 1600, 320
  7.000=1.5, 0.0, 1.0, 6.43, 3.71, 2.688, 73, 224, 4.3, 2.48, 1.88
  8.000=-273, 0, 0
  9.000=13, 657., 0.0
 10.000=$EOR
```

Figure 7

2. Be sure FDPREP is on the system, by entering the command

   GET FDPREP

   If the system responds by saying the FDPREP does not exist, then do

   LOAD FDPREP

   You must wait until the system says that FDPREP is loaded before proceeding.

3. Make DOPREP a local file, by entering the command

   GET DOPREP

   You will probably have to edit this file. Figure 8 is a copy of the current file:

```
 1.000=60118,BJH,L1500.
 2.000=PFILES(GET,FDPREP)
 3.000=PFILES(GET,CRS01)
 4.000=M77,I=FDPREP,-GO.
 5.000=LGO,CRS01.
 6.000=PFILES,PUT,CRS01N.
 7.000=PFILES,PUT,CRS01L1.
 8.000=PFILES,PUT,FINUFD.
 9.000=PFILES,PUT,SORUFD.
10.000=PFILES,PUT,BNYUFD.
11.000=PFILES,PUT,JOBFL1.
12.000=PFILES,PUT,JOBFL2.
13.000=$EOR
14.000=CRLOOP
15.000=BHLOOP
16.000=2035
17.000=MHD
17.020=AII054
19.000=$EOR
```

Figure 8

You must change all occurrences of CRS01 to the identification of the model to be run. In addition, the last five records should be:

a. Name of file containing boundary loop code

b. Name of file containing time-step loop code

c. Slot where output tape is stored, 4 digits

d. Visual Protect Key of tape (VPK), 3 letters

e. Tape label, 6 characters

PUT the new file.

4. Now you can run FDPREP. This usually runs very quickly, so you might as well wait for it. FDPREP produces the following files:

   BNYUPD — updated code for FDBNY

   SORUPD — updated code for FDSORS

   FINUPD — updated code for FINDIF

   New copy of model parameter file. The file name is the model name followed by N.

   Log file - name is model name followed by L1.

   Job file to run FDBNY and FDSORS. This file will need to be edited if you do not want to run both programs (see Step 5). File name is JOBFL1.

   Job file to run FINDIF. File name is JOBFL2.

5. Figure 9 is a sample of JOBFL1. If you want to run only FDBNY, delete records 9, 10, and 11. To run only FDSORS, delete records 6, 7, and 8.

```
1.000=60118,BJH,CY.
2.000=RESOURCE,JCAT=S4,TL=3600.
3.000=MFLINK,CRS01F,ST=LM3,DD=C6,JCS="*"
4.000=    "FFILES(GET,CRS01N)".
5.000=ATTACH,OBJLIB.
6.000=MFLINK,BNYFROC,ST=LM3,DD=C6,JCS="*"
7.000=   "FFILES(GET,BNYFROC)".
8.000=BEGIN,BNYFROC,BNYFROC,1023,CRS01B, 902,CRS01L2,CRS01F.
9.000=MFLINK,SORFROC,ST=LM3,DD=C6,JCS="*"
10.000=   "FFILES(GET,SORFROC)".
11.000=BEGIN,SORFROC,SORFROC,1299,CRS01S,465,CRS01L3,CRS01F.
12.000=$EOR
```

Figure 9

Figure 10 is file UPDBLIB. In record 4, change CRLOOP to the name of the file containing the variable loop code to be used in FDBNY. Now you can incorporate the update code into FDBNY and FDSORS, by submitting jobs UPDBLIB and UPDSLIB.

```
+++DISPLAY UPDBLIB
     1.000=60118,BJH.
     2.000=PFILES(GET,BNYLIB)
     3.000=PFILES(GET,BNYUPD)
     4.000=PFILES(GET,CRLOOP)
     5.000=UPDATEP(I=BNYUPD,P=BNYLIB,C=BNYFOR)
     6.000=PFILES(PUT,BNYFOR)
     7.000=*EOR
```

Figure 10

6. Now you are ready to submit JOBFL1, to run FDBNY and FDSORS. However, be sure you have at least 3000 words of local storage available, to hold the two log files.

7. When JOBFL1 has been completed, check to be sure it ran correctly. Look at the DAYFILE. Look at the two log files (CRS01L2 and CRS01L3, for example). You can use the hard-copy terminal at IPC to get listings of these files. You should then DELETE BNYFOR, SORFOR and the log files.

8. You can now prepare to run FINDIF. Figure 11 is a list of file UPDFLIB. Due to disk space limitations, FINDIF is stored as a basic source file. Before running UPDFLIB, you must run MAKFLIB. Then after you run UPDFLIB, you must delete FINLIB.

```
+++DISPLAY UPDFLIB
     1.000=60118,BJH.
     2.000=PFILES(GET,FINLIB)
     3.000=PFILES(GET,FINUPD)
     4.000=PFILES(GET,BHLOOP)
     5.000=UPDATEP(I=FINUPD,P=FINLIB,C=FINFOR)
     6.000=PFILES(PUT,FINFOR)
     7.000=*EOR
```

Figure 11

In record 4, change BHLOOP (if necessary) to the name of the file containing the variable loop code to be used in TSTEP1. BHLOOP contains the Bhasavanija (1983) code. STLOOP contains Stephen (1983) code. Then you can submit UPDFLIB to create the COMPILE file for FINDIF.

9. You will have to edit JOBFL2 if you are using a source or boundary file from a different model. For example, if you want to run model CRS02, and use the source file from CRS01. Figure 12 contains a list of JOBFL2. After record 13, insert the command

```
ATTACH CRS01S

SWITCH,CRS01,CRS02
```

This changes the name of file CRS01S to CRS02S, which is the file that FINDIF will be looking for.

10. Be sure you have plenty of file space available on the Front-End. You will need about 3000 words for the FINDIF log file. You can then submit JOBFL2. This will probably not run until evening, so you should ROUTE the job to WAIT.

11. Good Luck!

12. Send mail to Bill Whitson (AEX) to send tape that is specified slot # (line 30 in JOBFL2).

```
MAIL, FILE = MSGS, TO = AEX
```

Bill Whitson's phone number is (317)494-1787.

13. For accounting:

```
PFILES LIST CHARGES
```

14. To read the Cyber tapes on the VAX 11-780 (WMS) use programs RDSNAP and RDTMSER. These move the snap-shot and time-series files from tape to disk. These programs are in [FIND.MMH1.VEC] on the WHOI Blue VAX. Remember you must enclose file names on the tape in quotes:

```
MFA0: "CRS01T"
```

Figure 12

Job-file to run FINDIF

```
 1.000=60118,BJH,CY.
 2.000=RESOURCE,NT=1,JCAT=S4,TL=3600.
 3.000=ATTACH,OBJLIB.
 4.000=REQUEST,CRS01T/210.
 5.000=REQUEST,SNP1600/1648.
 6.000=REQUEST,SNP1920/1648.
 7.000=REQUEST,SNP2240/1648.
 8.000=REQUEST,SNP2560/1648.
 9.000=REQUEST,SNP2880/1648.
10.000=REQUEST,SNP3200/1648.
11.000=REQUEST,SNP3520/1648.
12.000=REQUEST,SNP3840/1648.
13.000=ATTACH,CRS01S.
14.000=ATTACH,CRS01B.
15.000=MFLINK,CRS01P,ST=LM3,DD=C6,JCS="*"
16.000=    "PFILES(GET,CRS01N)".
17.000=MFLINK,FINPROC,ST=LM3,DD=C6,JCS="*"
18.000=   "PFILES(GET,FINPROC)".
19.000=BEGIN,FINPROC,FINPROC,5025,CRS01L4,CRS01P.
20.000=DEFINE,CRS01T.
21.000=DEFINE,SNP1600.
22.000=DEFINE,SNP1920.
23.000=DEFINE,SNP2240.
24.000=DEFINE,SNP2560.
25.000=DEFINE,SNP2880.
26.000=DEFINE,SNP3200.
27.000=DEFINE,SNP3520.
28.000=DEFINE,SNP3840.
29.000=REQUEST,TAPE,D=6250,ACCESS=W,TF=V,RT=F,BT=K,
30.000=    RLMAX=132,RPB=40,SLOT=2035/MHD/AII054.
31.000=LABEL,A,MFN=TAPE,FID=CRS01T,LPROC=W,RT=F,BT=K,
32.000=    RLMAX=132,RPB=40,FSN=1.
33.000=LABEL,B,MFN=TAPE,FID=SNP1600,LPROC=W,RT=F,BT=K,
34.000=    RLMAX=132,RPB=40,FSN=9999.
35.000=LABEL,C,MFN=TAPE,FID=SNP1920,LPROC=W,RT=F,BT=K,
36.000=    RLMAX=132,RPB=40,FSN=9999.
37.000=LABEL,D,MFN=TAPE,FID=SNP2240,LPROC=W,RT=F,BT=K,
38.000=    RLMAX=132,RPB=40,FSN=9999.
39.000=LABEL,E,MFN=TAPE,FID=SNP2560,LPROC=W,RT=F,BT=K,
40.000=    RLMAX=132,RPB=40,FSN=9999.
41.000=LABEL,F,MFN=TAPE,FID=SNP2880,LPROC=W,RT=F,BT=K,
42.000=    RLMAX=132,RPB=40,FSN=9999.
43.000=LABEL,G,MFN=TAPE,FID=SNP3200,LPROC=W,RT=F,BT=K,
44.000=    RLMAX=132,RPB=40,FSN=9999.
45.000=LABEL,H,MFN=TAPE,FID=SNP3520,LPROC=W,RT=F,BT=K,
46.000=    RLMAX=132,RPB=40,FSN=9999.
47.000=LABEL,I,MFN=TAPE,FID=SNP3840,LPROC=W,RT=F,BT=K,
48.000=    RLMAX=132,RPB=40,FSN=9999.
49.000=COPYL,CRS01T,A.
50.000=PURGE,CRS01T.
51.000=COPYL,SNP1600,B.
52.000=PURGE,SNP1600.
53.000=COPYL,SNP1920,C.
54.000=PURGE,SNP1920.
55.000=COPYL,SNP2240,D.
56.000=PURGE,SNP2240.
57.000=COPYL,SNP2560,E.
58.000=PURGE,SNP2560.
59.000=COPYL,SNP2880,F.
60.000=PURGE,SNP2880.
61.000=COPYL,SNP3200,G.
62.000=PURGE,SNP3200.
63.000=COPYL,SNP3520,H.
64.000=PURGE,SNP3520.
65.000=COPYL,SNP3840,I.
66.000=PURGE,SNP3840.
67.000=*EOR
```

B. FINDIF on the CRAY XMP-12

(Based on Notes by Mary M. Hunt, June 1986)

I. Introduction

This document describes briefly the CRAY XMP-12 super-computer system at NRL in Washington and the implementation of Ralph Stephen's Finite Difference software on the system. The CRAY system includes a cluster of three VAX-11/785's, running under VMS, which serves as a Front-End.

All editing and other preparation are done on the VAX, and jobs are submitted to the CRAY for execution. The use of the VAX for the Front-End saves lots of problems, since we are used to the VAX.

I had previously implemented this same software package on a Cyber 205 at Purdue. This document includes the differences between the two systems.

II. General System Description

How to Log-on

All work to date has been done by direct telephone line to the computer - no networks. Use the DIAL class on the PACX.

A. Direct call from a VT100

1. Set terminal to 1200 Baud.

2. Access the DIAL class on PACX and enter #1 K K85 K 1 202 767 2000

3. Follow instructions in CCF (NRL-Central Computer Facility) guide, page 1-4 to log-in (Appendix II). A sample is given in Figure 1.

B. Direct call from DECwriter

1. Set terminal to 1200 Baud, and parity to code 2:

   a. Strike CTRL SET-UP
   b. Strike 0 (zero) key until display shows 1200
   c. Strike P key until display shows 2
   d. Strike SET-UP again

2. Then log-in as above.

Figure 1

Sample Log-on

```
enter class DIAL
class dial start

HELLO:I'M READY
*D
NUMBER?
#1K     K85K12027672000

DIALING...
RINGING...
ANSWER TONE
ONLINE

#
Digital Ethernet Terminal Server V2.0.1 - LAT V5.0

Enter username> STEPHEN
Local> CONNECT N


Username: STEPHEN
Password:


    Last interactive login on Friday,  9-MAY-1986 11:04
    Last non-interactive login on Monday,  3-MAR-1986 16:49
**************************************************************
*          Welcome to the Cray Front-End 11/785
*                        NRL3
```

Figure 2

Sample Log-on To Save The Session

```
enter class RED
class red start

Username: IPC_MMH1
Password:

WHOI RED system

     Last interactive login on Thursday, 29-MAY-1986 14:37
     Last non-interactive login on Thursday, 29-MAY-1986 15:07

         ==> MESSAGE CHANGED" 2-JUN-1986 07:51:07.60 BY ACC_BRC1

SPAK UNAVAILABLE: The SPAK-disk will be unavailable this morning, Monday,
          June 2, 1986.

QUEUE AVAILABILITY CHANGED:  Low cost batch queues are now open more hours.
          Please read new IPC Newsletter (#84) for details.  Thanks.  (14 Mes

    2-JUN-1986 08:16:28
$ ALLO PACX1
%DCL-I-ALLOC, _TXE0: allocated
$ SET TERM/SPEED=1200/MODEM PACX1
$ SET HOST/LOG/DTE PACX1

%REM-I-TOEXIT, connection established, type ^\ to exit
enter class DIAL
class dial start

HELLO:I'M READY
*D
NUMBER?
#1K      K8SK12027672000

DIALING...
RINGING...
ANSWER TONE
ONLINE

#
#
#
Digital Ethernet Terminal Server V2.0.1 - LAT V5.0

Enter username> STEPHEN
Local> CONNECT N


Username: STEPHEN
Password:-
```

C. To get your entire session copied to a file on the VAX:

1. Log-on to RED, using a CRT terminal.

2. $ALLOCATE PACX1
   $SET TERM/SPEED=1200/MODEM PACX1
   $SET HOST/LOG/DTE PACX1

3. You will then get the 'enter class' prompt. Enter DIAL, and proceed as above. The session will be stored in a file called SETHOST.LOG. See sample in Figure 2.

D. If, during a session, you suddenly get the message LOCAL , do not panic. You can get reconnected by typing RESUME.

Inter-computer Communication

Communication between the VAX and the CRAY is very easy. On the VAX end, there are a set of 'station' commands for CRAY communication. There are only a few you will need:

1. To submit a job to the CRAY

   $CRAY SUBMIT file-spec

   where 'filespec' is the name of a file containing the desired CRAY JCL.

2. To see if the job has completed

   $CRAY STATUS/OWNER

   Any uncompleted jobs you have submitted to the CRAY will be listed.

3. To watch the progress of a CRAY job, you can issue the VAX command

   $CRAY SET TERMINAL INFORM

   before submitting a CRAY job. This will result in a message whenever a file transfer between CRAY and VAX (in either direction) occurs.

These are the only commands I have used.

On the CRAY end, the command to access a file from the VAX is

```
FETCH,DN=cfile,TEXT='vfile'
```

where

cfile is the CRAY local dataset name
vfile is the VAX file spec

To send a file from the CRAY to the VAX

```
DISPOSE,DN=cfile,TEXT='vfile'
```

Some CRAY Control Commands

Every CRAY control command must end with a period.

1. JOB - Every CRAY job must start with a JOB command. The form of this command is JOB,JN=jobname,T=time,MFL=size,*TAPE=ntapes.

jobname	is the job-name. The output will be returned to the VAX in a file called jobname.CPR
time	is the maximum job CPU time, in seconds. If not specified, the limit is 8 seconds.
size	is the maximum memory used, in words. The default is 135000. The maximum available is 1,536,000.
ntapes	is the number of magnetic tape drives required by the job. If no tapes are required, the *TAPE should be omitted.

   The minimum job card would be JOB,JN=job-name.

2. ACCOUNT - The second command must be ACCOUNT:

   ```
   ACCOUNT,AC=acno,US=usno,UPW=pswd
   ```

acno	is account number
usno	is user name
pswd	is user password

3. ACCESS - In order for a job to use a permanent dataset (file), you must include an ACCESS command to make the dataset local:

   ACCESS,DN=dname.

   dname is the permanent and local name of the dataset

4. ASSIGN - This command is used to connect a Fortran logical unit to a file. It is not required if the program does an explicit OPEN including the local dataset name:

   ASSIGN,DN=dname,A=FTnn.

   dname is the local dataset name
   nn is the Fortran unit number

   There are many other parameters which can be included on an ASSIGN command. For the most part, they are inscrutable.

5. DELETE - To delete a file, you must first make it local to the job, with the unique access:

   ACCESS,DN=dname,UQ.

   Then you can delete the file:

   DELETE,DN=dname.

   Adding NA to either of these commands will prevent the job from being aborted if an error occurs.

Tapes

Tape usage is very awkward and poorly documented. They have written a Tape Guide for the CRAY, but it is not much better than the CRAY manual, and in some places is incorrect. There appear to be three possible ways to create a tape.

1. Create an ANS labeled tape directly on the CRAY. The Control command options appear to allow this. However, it cannot be done. The consultants had told me this, but I didn't believe it until I tried. You cannot create a labeled tape on the CRAY which can be read by the VAX.

2. Use the *TAPE option on the DISPOSE command which allows you to send a CRAY file directly to a VAX tape. This does not work for multiple files, and does not include the capability to tell the operator to use a write ring. You must send him (or her) a message somehow to let him (or her) know you need a write ring.

3. DISPOSE all the files from the CRAY to the VAX, and then copy them interactively, from the VAX to tape. When running large models, there might not be room in our disk allocation (10000 blocks) for all the output files. One of the consultants suggested DISPOSing and copying the files one at a time. This solution also means that you must log-on again after the CRAY job has completed, perhaps wait for a tape drive, copy the files, and send the operator a message to mail the tape.

I think the second solution is the least objectionable. It does mean we must combine all the output into one file, and make an arrangement with the operators always to use a write ring when mounting a tape for STEPHEN. We then, when the tape has been created, can make arrangements to mail it back here.

In addition to the difficulties mentioned above, there are two other anomalies in the tape usage:

1. There does not appear to be any way to run a batch job on the VAX using tapes. They do not appear to have the equivalent of our tape queues and GETDEV.

2. There is no way for the system to distinguish between an internal tape label and an external tape label, except for interactive usage on the VAX. Otherwise, the system assumes that the numeric external label, assigned by the NRL staff, is the same as the internal ANS label.

Comparison to Cyber

The CRAY and CYBER computers seem to me to differ very little in ease (or difficulty) of use. The systems as a whole, however, differ considerably.

In some ways, the NRL CRAY system is easier to use than the CYBER system at PURDUE. For one thing, the VAX Front-End is much easier to use than the CYBER 6600 at Purdue. Another advantage is that the log output (DAYFILE on CYBER) is automatically returned to the Front-End as soon as the job is completed.

Disadvantages of the CRAY system are relatively poor and badly documented tape handling. Theoretically the tape handling looks good, but it does not appear to work as advertised. Also, there is no way the people at NRL could match the superb support and help we got from the Purdue staff, especially Bill Whitson. The big problem at NRL is that you might get a different consultant each time you call, and they don't always agree.

The CRAY presents severe limitations on the size of model that can be run, as compared to the Cyber at Purdue.

1. The CRAY has only 2 million words of memory, the CYBER has 4 million.

2. The CRAY has no HALF PRECISION data type, so all arrays use the full 64 bits.

3. There is no virtual memory on the CRAY, and the extended memory option is not implemented on the NRL machine.

Other differences are that UPDATE cannot be run on the Front-End, as we did on the CYBER, and that the CRAY allows multiple versions (they call them editions) of the same file. I am not sure if these items make much difference in the ease of operation; they are just different.

The CRAY documentation at first looks good. When you try to use it however, it is confusing, incomplete, and sometimes contradictory. For example, see the description of ASSIGN (page 8-1) and ACCESS (page 9-5) in the CRAY-OS Reference Manual. There does not appear to be any documentation about the vectorization process. They teach a class about it, but there is no documentation.

III. Implementation of FINDIF Software

Programs

The package includes four programs. The first, Program FDPREP, runs on the VAX Front-End, and creates files needed to run the other programs on the CRAY. The only input to FDPREP is a model parameter file, describing the model and the output desired.

The next two programs, FDBNY and FDSORS, run on the CRAY, and each creates a file which is required by the final program, FINDIF.

In addition to the programs, there is another file of source code, containing subprograms used on the CRAY.

Implementing the INCLUDE

The procedure required to include COMMON files into a source deck, using UPDATE, is a two-step process. First, your basic source file is subdivided into COMDECK's and DECK's, as shown in Figure 3. COMMON blocks which do not change are completely specified, but variable blocks remain undefined. The first step is to incorporate the COMDECK's into the DECK's, to create what they call a Program Library. There is a job-file to do this step for each program, as shown in Table 1. These create, on the CRAY, the program library files BNYLIB, SORLIB, and FINLIB.

Figure 3

Form of Source File

```
*COMDECK MODPAR
      COMMON /MODPAR/  IRECT, IDENS, IFLAT, IKELLY
      COMMON /MODPAR/  IEXPL, IVERT, ITRAN, ISORB, ISNST
        etc.
*COMDECK IOUNIT
      COMMON /IOUNIT/  LULOG, LUINP, LUBNY, LUSRC
      COMMON /IOUNIT/  LUSNP, LUTST
*COMDECK COMFD8
      COMMON /COMFD8/
*DECK FINDIF
      PROGRAM FINDIF
            .
            .
            .
*CALL MODPAR
*CALL IOUNIT
*CALL COMFD8
            .
            .
      END
*DECK ABSORB
      SUBROUTINE ABSORB
            .
            .
            .
*CALL MODPAR
*CALL COMFD8
            .
            .
            .
      END
*DECK TSTEP1
      SUBROUTINE TSTEP1
            .
            .
            .
*CALL MODPAR
*CALL COMFD8
            .
            .
            .
      END
```

Table 1

Files used for UPDATE procedures

Program	Basic Source File (VAX)	Job To Create Program Library (VAX)	Program Library (CRAY)	File Containing Update Code (VAX)
FDBNY	FDBNY.DCK	MAKBLIB.JOB	BNYLIB	BNYUPD.DCK
FDSORS	FDSORS.DCK	MAKSLIB.JOB	SORLIB	SORUPD.DCK
FINDIF	FINDIF.DCK	MAKFLIB.JOB	FINLIB	FINUPD.DCK
subroutines	LIBSUB.DCK	MAKLIB.JOB	OBJLIB	

These files are already created, so this first step does not need to be done unless changes in the source code are required.

Program FDPREP creates COMMON files for each of the three other programs. The UPDATE procedure to incorporate these files into the program libraries is part of the job files to run the programs, so needs no separate job.

Vectorization

When this package was implemented on the CYBER, I used explicit vectorization commands. Such commands do not exist (or are not documented) on the CRAY, so each of these one-line commands had to be rewritten as a DO-LOOP. This tedious operation was done by Lee Gove before I became involved with the CRAY.

Permanent files on the VAX

1. File for FDPREP

FDPREP.FOR	source
FDPREP.OBJ	object
FDPREP.EXE	executable

2. Source files for CRAY

LIBSUBS.DCK	subprograms
FDBNY.DCK	source for FDBNY
FDSORS.DCK	source for FDSORS
FINDIF.DCK	source for FINDIF

3. Permanent job files

MAKLIB.JOB	creates subroutine object library on CRAY
MAKBLIB.JOB	
MAKSLIB.JOB	create UPDATE program libraries on CRAY
MAKFLIB.JOB	

4. Procedure files

BNYPROC.PRC	These files contain the
SORPROC.PRC	constant part of the procedures
FINPROC.PRC	to run each program

Permanent Files on the CRAY

Any other files are superfluous, and should be deleted.

1. Program library files

OBJLIB	subprogram object library
BNYLIB	
SORLIB	*Program library files from UPDATE*
FINLIB	

2. Files required during a model (say BNCH1)

BNCH1B	boundary file
BNCH1S	source file

IV. Steps to Run a Model

1. Create a model parameter file, which can be free field format, except for the first two records. The contents of the records:

   Record 1: LABEL, up to 80 characters

   Record 2: Model identifier, 5 characters, much be in first 5 characters

   Record 3: values of IRECT, IDENS, IFLAT, IKELLY, IEXPL, IVERT, ITRAN, ISORB, ISNST

   Record 4: values of MM, NN, KK, KSTRT, DELT, DELR, DELZ

   Record 5: values of KOUTST, KOUTEN, MOUTST, MOUTEN, NOUTST, NOUTEN

   Record 6: values of KINC, MINC, NINC, KMARK, KMINC

   Record 7: values of VP1, VS1, RO1, VP2, VS2, RO2, NA, NB, VPT, VST, ROT

   Record 8: values of ND, MSW, NSW

   Record 9: values of NSORCE, PLSWID, TSWAVE

Below is a sample model parameter file.

```
  CRS01:  ROSE SCATTERING - GRADIENT
CRS01
1, 1, 1, 1, 1, 0, 0, 1, 2
999, 300, 4000, 1000, 0.00125, 0.01, 0.01
1500, 4000, 1, 999, 48, 148
2, 50, 50, 1600, 320
1.5, 0.0, 1.0, 6.43, 3.71, 2.688, 73, 224, 4.3, 2.48, 1.88
-273, 0, 0
13, 657., 0.0
```

2. ASSIGN the model parameter file to FOR055, and run FDPREP:

```
$ASSIGN fspec FOR055
$RUN FDPREP
```

The program asks for the tape number (6 digits) for the final output tape containing snap-shot files and time series file.

FDPREP creates the following files:

1. BNYUPD.DCK
   SORUPD.DCK — These files contain update code
   FINUPD.DCK — for COMMON for the three programs

2. JOBFL1.JOB — Job to run FDBNY and FDSORS
   JOBFL2.JOB — Job to run FINDIF

3. File containing log output. Name is FILEID and .LG1. For example, if FILEID is BNCH1, filename is BNCH1.LG1.

4. File containing updated version of parameter file. Name is FILEID and P.DAT. If FILEID is BNCH1, filename is BNCH1P.DAT

3. If any of the three programs needs editing, do the edits, and create a new program library on the CRAY, by submitting

MAKBLIB	for	FDBNY
MAKSLIB	for	FDSORS
MAKFLIB	for	FINDIF

4. Below is the job (JOBFL1.JOB) to run FDBNY and FDSORS.

```
  JOB,JN=RNBNSR,T=3600,MFL=149876.
  ACCOUNT,AC=28X127X6,US=STEPHEN,UPW=
* ACCESS,DN=BNCH1B,UQ,NA.
* DELETE,DN=BNCH1B,NA.
* FETCH,DN=BNCH1P,TEXT='BNCH1P.DAT'.
* ASSIGN,DN=BNCH1P,A=FT55.
* FETCH,DN=BNYPROC,TEXT='BNYPROC.PRC'.
  ACCESS,DN=OBJLIB.
* CALL,DN=BNYPROC.
* DISPOSE,DN=BNCH1LB,TEXT='BNCH1LB.LST'.
* SAVE,DN=BNCH1B.
@ ACCESS,DN=BNCH1S,UQ,NA.
@ DELETE,DN=BNCH1S,NA.
@ FETCH,DN=BNCH1Q,TEXT='BNCH1P.DAT'.
@ ASSIGN,DN=BNCH1Q,A=FT55.
@ FETCH,DN=SORPROC,TEXT='SORPROC.PRC'.
@ CALL,DN=SORPROC.
@ DISPOSE,DN=BNCH1LS,TEXT='BNCH1LS.LST'.
@ SAVE,DN=BNCH1S.
```

To run only FDSORS, delete the records marked with *. To run only FDBNY, delete the records marked with 0. Then submit the job.

When the job has completed, make sure it has run correctly, by typing the output file, RNBNSR.CPR. Also the two log files, BNCH1LB.LST (from FDBNY) and BNCH1LS.LST (from FDSORS).

Files BNYPROC and SORPROC are given below.

```
FETCH,DN=BNYUPD,TEXT='BNYUPD.DCK'.
ACCESS,DN=BNYLIB.
UPDATE,P=BNYLIB,I=BNYUPD,N=0,C=BNYFOR,L=0,F.
CFT,I=BNYFOR,L=0,B=BNYBIN,OFF=V.
LDR,DN=BNYBIN,LIB=OBJLIB.
```

```
FETCH,DN=SORUPD,TEXT='SORUPD.DCK'.
ACCESS,DN=SORLIB.
UPDATE,P=SORLIB,I=SORUPD,N=0,C=SORFOR,L=0,F.
CFT,I=SORFOR,L=0,B=SORBIN,OFF=V.
LDR,DN=SORBIN,LIB=OBJLIB.
```

5. Below is the job (JOBFL2.JOB) to run FINDIF.

```
JOB,JN=RUNFIN,T=600,MSL=0150812.
ACCOUNT,AC=28Y127X6,US=STEPHEN,UPW=          .
FETCH,DN=BNCH1B,TEXT='BNCH1B.DAT'.
ASSIGN,DN=BNCH1B,A=FT55.
→ ACCESS,DN=BNCH1B,PDN=BNCH1B.
ACCESS,DN=BNCH1S,PDN=BNCH1S.
FETCH,DN=FINPROC,TEXT='FINPROC.PRC'.
CALL,DN=FINPROC.
DISPOSE,DN=BNCH1LD,TEXT='BNCH1LD.LST'.
SAVE,DN=SNP0100,PDN=BNCH1OUT.
DISPOSE,DN=SNP0100,DC=MT,TEXT='STAPE/VOL=002906/UNLOAD TBNCH1.DAT'
```

If you want to use a source or boundary file from a different model, you will have to edit this file. For example, in the job above, if you want to use the boundary file produced from model BNCH2, you would change the record with the arrow to

```
ACCESS,DN=BNCH1B,PDN=BNCH2B.
```

This gives the local name BNCH1B to the permanent file BNCH2B.

You can then submit this job to the CRAY:

```
$CRAY SUBMIT JOBFL2.JOB
```

The output file will be returned to the VAX Front-End as RUNFIN.CPR, and the log file will be BNCH1LD.LST. If they look correct, you can MAIL a message to the operator to send the tape.

C. ACKNOWLEDGEMENTS

We would like to thank Bill Whitson of the Purdue University Computing Center for his patient support of our work. The Cyber 205 portion of this research was funded by the National Science Foundation under Grants OCE-8117571 and OCE-8409155. The Cray-XMP development was funded by the Office of Naval Research under Contract #N00014-85-C-0001NR.

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Appendix

Summary of CYBER Use at the Purdue University Computer Center

by Mary M. Hunt - May, 1985

I spent a week during August 1984 working at the Purdue University Computer Center (PUCC), to learn how to use their Operating System, and to try to get the FINDIF software operational on their Cyber 205 Super Computer. I was doing this work for Dr. Ralph Stephen of the Woods Hole Oceanographic Institution, who was a recipient of an NSF grant to use a Super Computer. I had previously had a small amount of experience using a CYBER 205. Since then I have spent about two months working on the project.

The FINDIF software consists of four programs, originally written by Dr. Stephen for the VAX 11/780 at W.H.O.I. These programs have all been modified by me, primarily to make them more transportable. Hunt, Gove and Stephen (1983) describes the programs in detail. The first program determines array sizes to be used by the other three programs, and checks parameter values for consistency and physical compatibility. This program, which runs on the Front-End system at Purdue, has been substantially modified, and now creates job files to run the other programs. The second and third programs create files on the 205 which are required by the final program in the series. Modifications to these programs has been minimal. Sections of the final program have been completely rewritten in vector code, in order to make the greatest possible use of the vector processor on the Cyber 205.

Some of the problems encountered have been:

1. The method employed by the MACE operating system to incorporate code into a source file is cumbersome. This is partly because the code is stored on the Front End, and compiled on the 205. This feature is used for COMMON specifications, and for some sections of code which change with different applications.

2. The operating system in general is very unforgiving; there are many things you must remember in order to get a model to run successfully.

3. The amount of disk storage allowed on the Front End is rather limited.

I hope these problems have been either circumvented or at least well enough documented so they will not cause problems in the future.

Some of the things I particularly like in the Purdue Computer Center Operating systems are their Dump/Load capability, which makes it very easy to back up and restore files on the Front End; the post-mortem dump on the Cyber 205, which can be a big help in determining exactly when and why a program aborts; and their system of documentation, which appears to be flexible and thorough.

Bill Whitson, who was given the task of advising NSF grant recipients, has been extremely helpful. He has responded quickly to questions via computer mail, initialized tapes, mailed tapes back to Woods Hole, and in general done everything possible to expedite things. The staff has also been responsive to the special requirements of long-distance researchers. Finally, when I encountered a bug in the Fortran run-time library, it was fixed very quickly.

We have so far succeeded in running a few small models for test purposes, and two large models. The times are incredibly fast; a model which took 7 hours 40 minutes on the VAX ran in 3 minutes on the Cyber 205. Now that our package has been debugged and documented, we should be able to process additional models with no more problems.

Hunt, M.M., Gove, L.A., and Stephen, R.A. 1983. FINDIF: A Software Package to Create Synthetic Seismograms by Finite Differences. WHOI Technical Memorandum, WHOI-82-42.

MMH:vms

Appendix II

NRL-Central Computer Facility Log-on Procedures

CHAPTER 1

ORIENTATION

1.1 GENERAL INFORMATION

1.1.1 Introduction To The CCF

NRL's Research Computation Division (RCD) operates the Laboratory's Central Computer Facility (CCF) for the purpose of scientific research and development. CCF services are available to NRL employees and are conditionally available to the Department of Defense and other government agencies and their contractors.

This system consists of a Cray X-MP/12 computer front-ended by a cluster of three VAX 11/785s. The Cray is a powerful, general purpose machine that combines a single processing unit with 2 million 64-bit words of memory. It has an I/O subsystem with three interconnected I/O processors. The Cray X-MP/12 achieves extremely high processing rates by efficiently using the scalar and vector capabilities of the CPU combined with the system's random-access solid-state memory (RAM) and registers. Sustainable speeds of 50 to over 100 million floating point operations (MFLOPS) can be achieved by vectorizable Fortran codes.

The VAXcluster*, which has 8 megabytes of main memory per processor, supports electronic mail and file transfer. The front end provides communications via both terminal lines and local area networks. This configuration will allow many users to share the CCF concurrently. The front-end systems also provide such services as data base management systems, a document processor, and graphics support.

For an interim period, the RCD also operates a DECsystem-10 computer. There is a separate user guide for this computer, available in building 97, room 155.

* VAXcluster is a trademark of Digital Equipment Corporation

1.1.2 The Research Computation Division

The RCD has two branches: a User Support Branch and a Systems Support Branch. The User Support Branch provides CCF services including user consulting, problem solving, and training, as well as computer operations and local area network operations support. The Systems Support Branch provides for the software and engineering of the CCF, including acquiring or developing special system software for the CCF, the local NRL network (NICENET), and the host front-end to ARPANET/MILNET.

RESEARCH COMPUTATION DIVISION

TITLE	CODE	NAME	PHONE area (202) autovon 297-
DIVISION HEAD	2800	Rudi F. Saenger	767-2751
DEPUTY DIVISION HEAD	2801	Doris E. Gossett	767-6750
ADMINISTRATIVE OFFICER	2802	Beulah M. Thomas	767-6750
COMPUTER RESOURCES BRANCH HEAD	2810	George E. Perez	767-3884
USER SERVICES SECTION HEAD(acting)	2811	George E. Perez	767-3884
COMPUTER SERVICES & OPERATIONS SECTION HEAD	2812	Jay S. Oberfield	767-3903
SYSTEMS SUPPORT BRANCH HEAD	2850	Harvey K. Brock	767-3887
SOFTWARE SECTION HEAD	2851	Dale A. Pfaff	767-3190
COMMUNICATIONS & ENGINEERING SECTION HEAD	2852	Rufus D. McCulloch	767-3903

Phone numbers to call for various services:

CCF 300/1200 baud dial-in line	767-2000
CCF 2400 baud dial-in line	767-1240
CCF status recording	767-3512
CCF consultant's desk	767-3542, 767-1374
CCF Customer Service Counter	767-3993
NRL Internet coordinator	767-3884
NRL-NFE 300/1200 baud dial-in	767-4830
DECsystem-10 dial-in	767-5333, 767-3816
DECsystem-10 operations	767-3794

1.1.3 Opening An Account

NRL employees and their contractors who wish to establish an account on the CCF should report in person to the Customer Service Counter (CSC) in building A49. There an application form must be filled out which will allow you to use both the VAXcluster and the Cray. The RCD staff will then verify that the job order number is valid. Each account on the CCF will be issued the following identification:

1) username

2) password

3) account number (NRL JON)

We don't recommend more than one person per account. If several customers wish to work on a project together, on the front-end we can issue each an account using the same account number and group number (UIC) with different usernames and programmer numbers. Files can then be transferred conveniently between several users while the computer usage of each is accounted for separately.

Non-NRL employees should make initial inquiries about the system by calling the CCF Outside Users Coordinator in User Services, (Autovon)297-3884 or (202)767-3884. Navy installations obtain a CCF account by submitting a Work Request (Form 2275) to the NRL Budget Officer, Code 1310, NRL, Washington, D.C. 20375-5000. Department of Defense (non-Navy) installations submit a Military Interdepartmental Purchase Request (Form DD 448). Government agencies and private companies submit cash in advance to the NRL Budget Officer.

1.1.4 Accessing The CCF

The CCF can be accessed via dial-up phone lines, via the NRL local area network (NICENET), via network connections with certain NRL VAX computers outside the RCD, and via DDN/MILNET. There are 48 dial-up lines and 16 local area network connections into the CCF. NICENET and DDN/MILNET connections are currently being worked out. Detailed information on these will be added later.

1.1.5 Dialing The Computer

The CCF front end will receive and transmit data at several different speeds which are measured by the baudrate(bits per second). You will have to:

1) know what baud rates your modem will handle
2) set your terminal to the speed you desire (see setting terminal parameters)
3) dial 767-2000 for 300/1200 baud, or 767-1240 for 2400 baud

As soon as you make the connection, type several carriage returns so that the terminal server can determine your baud rate. You will have a wait of up to 30 seconds, then you will see a pound sign prompt from the terminal server for the password:

```
#
```

Type in "N" and press the carriage return key, as usual the password will not echo. Next the terminal server will prompt you for your username:

```
Enter username>
```

Type in your CCF VAX username and press carriage return. You will then be prompted by the ethernet:

```
LOCAL>
```

Since the CCF front end is actually several nodes in a VAXcluster, you can tell the terminal server to either choose a node for you by typing immediately after the ethernet prompt:

```
CONNECT N
```

or select one of the three VAXcluster nodes by typing:

```
CONNECT NRL1
or
CONNECT NRL2
or
CONNECT NRL3
```

A CCF VAX will then begin the timesharing dialogue. It will prompt you with "Username:", indicating that you're ready to login.

1.1.6 CCF Initial Log-on/Log-off Procedures

You will type your username and password to log into the VAXcluster. Your "username" is generally your last name. Your "password" was chosen by you when you opened your account. The first time you log in to the VAX you will be required to change your password (the system will prompt you).

To submit a job to the Cray, you will use (on the ACCOUNT statement) your username as the user number (US), your "original" VAX password as the user password (UPW) and your job order number (no hypens) as your account number (AC). You will be required to change your Cray user password, by adding the NUPW (new user password) parameter on the ACCOUNT statement, the first time you submit a Cray job.

For your first Cray job, use JOB and ACCOUNT statements like:

```
JOB, JN=anyname.
ACCOUNT, AC=acntnmbr, US= username, UPW=originalpassword,^
         NUPW=newpassword.
```

For subsequent jobs, UPW now equals the new password set by NUPW.

To log off the system, you will need to type "LOG" twice. The first "LOG" will log you off the VAX; then you will see the LOCAL> prompt. Be sure to type LOG again to log yourself off the terminal server.

END

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